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PROCESS AND APPARATUS FOR THE BURNING-IN OF LAYERS ON PRINTING PLATES

Abstract of the Disclosure

This invention relates to an improvement in the process for burning-in the exposed and developed layer of a sensitized printing plate by heating, the improvement comprising heating the layer by electromagnetic radiation.

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Abstract of the Disclosure

This invention relates to an improvement in the process for burning-in the exposed and developed layer of a sensitized printing plate by heating, the improvement comprising heating the layer by electromagnetic radiation.

This invention relates to the burning-in of an exposed and developed layer of a sensitized printing plate by means of electromagnetic radiation.

It is known to subject light-sensitive presensitized offset printing plates, after image-wise exposure, development and correction, to a brief heat-treatment, by passing a flame over them, preferably from the back, or by treating them with a hot flatiron, or by conducting them over heated rolls. By this treatment, the areas forming the printing image, i.e. the parts of the diazo layer retained on the support, are "burned-in", i.e. altered in two respects: To begin with, the image areas on the base are mechanically hardened by after-heating, so they are less easily damaged by light action, e.g., during storage and printing, and yield considerably longer runs. Further, the image areas become chemically more resistant by an intensive heat-treatment, so they are less susceptible to attack by printing inks containing large proportions of solvent or by etching agents, than are the areas of a layer which has not been burned-in. In the case of positive-working offset printing plates, for example, these changes become visible by a change of color of the originally yellow-green diazo layer to pink

during the first phase of the burning-in process, and then to brown during the second phase.

The above mentioned heating methods are disadvantageous, however, in that they do not guarantee a satisfactory reproducibility of the temperature generated in the printing plate and may even damage the plate, and a uniform burning-in of all image-areas of the plate is not possible.

Attempts have been made to eliminate these drawbacks by heating the printing plate in an oven instead of in the manner described above. In this manner, a temperature can be maintained which is much more easily reproducible. The uniformity of burning-in is also markedly improved, although it is not completely satisfactory. In order to avoid mechanical damage to the plate, however, great care must be taken when placing the plate into the oven. Further, because of the predominantly convective heat transfer, long heating-up periods must be tolerated until such an oven has reached the desired temperature and the printing plate has also attained this temperature. These disadvantages become the more aggravating the larger the size of the printing plate which is to be subjected to a heat-treatment. It is much more difficult to obtain an overall uniform temperature in large ovens than it is in smaller ones, and, further, large ovens are expensive and their operation is costly, because the heating-up time increases with the size of the oven.

The present invention provides a more uniform, more rapid, and more economical performance of the thermal treatment of printing plates than was hitherto possible.

According to the present invention, the layer is heated by electro-magnetic radiation. An apparatus for performing the process

also is provided which comprises a plate holder and a heating element. The heating element is a source of electro-magnetic radiation which is movable relative to the plate holder.

In principle, the process of the invention may be applied to any desired type of printing plate, provided the minimum temperature at which burning-in of the layer produces the desired effect and the maximum temperature to which the base material may be exposed can be satisfactorily reconciled. When the layer is a light-sensitive diazo layer, the minimum temperature required for burning-in has been found to be about 180°C. In the case of polyester base films, temperatures in the range from 180 to 200°C are barely permissible, whereas aluminum supports can be heated to about 250°C without exhibiting any detrimental recrystallization phenomena. Other metallic supports, e.g. brass or steel, endure even higher temperatures.

In order to maintain the thermal stress upon the base as low as possible, burning-in of the layer is preferably performed by causing the electro-magnetic radiation to act upon the layer side rather than on the back side of the printing plate. If necessary, the back of the plate may additionally be in contact with a cooled support. The irradiated energy is utilized much better, however, when heat conduction from the back of the printing plate is avoided, either by fastening the plate in a suitable clamp and suspending it freely in the air, or by placing it upon a support with thermal insulation, i.e. by inserting a layer of asbestos between the back of the plate and the surface of the support, or by maintaining an air gap between the plate and the support, or by other suitable means.

In order to avoid local over-heating and to distribute the electro-magnetic radiation as evenly as possible, it has proved to be

of advantage to move the printing plate and the source of radiation past each other, preferably while maintaining a finite distance between them. This may be accomplished, for example, by fastening the printing plate to the surface of a cylinder which constantly rotates past the source of radiation. Alternatively, the printing plate may be mounted on a carriage and moved in one plane to and fro in front of the source of radiation, or the source of radiation may be moved in front of the printing plate. In a special embodiment, the process of the invention may be performed continuously, by causing several printing plates to pass in close succession through a zone heated by several radiation sources.

In order to cause all image areas of a printing plate to be burned-in as uniformly as possible and to obtain the highest possible thermal effect, it has proved advantageous to have the electromagnetic radiation act simultaneously over the entire width of the printing plate. Thus, a tubular source of radiation is preferred, which is positioned transversely to the direction of the relative motion between the printing plate and the source of radiation, with its radiation focused upon a straight line extending over the entire width of the printing plate.

An even better utilization of the irradiated energy may be obtained by dyeing the layer to be burned-in and thus increasing the absorption of radiation. In many cases, this involves no additional work, because, to facilitate correction after development, most printing plates are provided with a colored layer, which improves the contrast between the image areas and the background.

As noted above, it is a prerequisite for the satisfactory performance of the process of the invention that the layer to be

burned-in is heated to a temperature which is sufficiently high, whereas the base material must not be heated beyond a certain limit which is specific to the material used. To avoid destruction of the printing plate by the after-heating process, the temperature of the base is advantageously limited by controlling the relative motion between the printing plate and the source of radiation, and, if necessary, also by changing the distance between the printing plate and the source of radiation, the maximum values adjusted being of course adapted to the particular combination of layer and base used. In a special embodiment of the present process, this temperature control is effected automatically, preferably by impulses given by a temperature measuring device in contact with the back of the base material.

In addition to the customary supporting and conveying means, an apparatus suitable for performing the process of the invention contains, as an essential feature, a heating element which heretofore has not been used for this purpose, viz. a source of electro-magnetic radiation, preferably a quartz-halogen lamp. In a preferred embodiment of the apparatus, this source of radiation is in the form of a tube and is equipped with an elliptic radiation reflector which effects an optimum focusing of the radiation upon the layer to be burned-in.

The sources of electro-magnetic radiation proposed according to the invention are distinguished by a heating-up period which is considerably shorter than that of ovens. This particularly holds true for quartz-halogen lamps, which reach their color and operational temperature about one second after being switched on. With good reflection and focusing, about 65 per cent of the radiation emitted by such a lamp can be beamed upon the surface to be heated. When the layer possesses a high intrinsic absorptive capacity for the wave length emitted, the

irradiated energy is almost completely used for heating. If this should not be the case, the layer to be burned-in may be colored with a suitable dyestuff. Even if the geometrical and absorptive conditions are not particularly good, the process of the invention causes considerable savings in energy and time, as compared with known after-heating processes. Surprisingly, no negative effects caused by heating the layer by way of a "thermal shock" were found. The partial pyrolytic decomposition of the frequently resin-containing layer composition - which inevitably occurs during heating to the burning-in temperature, but, surprisingly, has no detrimental effect upon the layer in the hitherto used, relative expensive burning-in processes, when due care is taken - is not increased by the process of the invention, despite the steep temperature increase, so the quality of the printing plate is not adversely affected.

The quartz-halogen lamp preferably used according to the invention has essential advantages over other known electro-magnetic sources of radiation, such as known ultra-red heating rods: its heating-up period is 2 seconds at the most, as compared with at least 30 seconds in the case of such heating rods, which facilitates a faster and more economical operation; further, due to the smaller dimensions of the light source, it enables a better focusing, i.e. more exact beaming of the irradiated energy on the layer (an advantage which is particularly evident when thicker bases are used); and, finally, it has a considerably higher proportion of radiation within the visible range of the spectrum, whereby the hardening effect of the heat-treatment is significantly increased, particularly in the case of positive-working offset printing plates, because the light-sensitivity of the image areas, which affects their mechanical strength, is lost by irradiation with visible light.

Nevertheless, in specific cases, other sources of electro-magnetic radiation also may be used for the after-heating of printing plates. It is possible to adapt the desired thermal treatment to the requirements of a particular case insofar as duration, intensity, and effectiveness of the treatment and the most suitable means to be selected are concerned.

The invention will be further illustrated by reference to the accompanying drawings in which one embodiment of an apparatus according to the invention is shown.

In the drawings, reference numeral 1 designates a plate or frame to which a printing plate to be burned-in is secured. Numeral 2 designates the printing plate to be burned-in. Numeral 3 designates a source of electro-magnetic radiation and numeral 4 designates a cable for conducting current to the source of radiation. Numeral 5 designates a reflector.

It will be obvious to those skilled in the art that many modifications may be made within the scope of the present invention without departing from the spirit thereof, and the invention includes all such modifications.

WHAT IS CLAIMED IS:

1. In the process for burning-in the exposed and developed layer of a sensitized printing plate by heating, the improvement which comprises heating the layer by electro-magnetic radiation.

2. A process according to claim 1 in which the radiation is infrared leaving 10 to 15 per cent thereof in the visible range of the spectrum.

3. A process according to claim 2 in which the plate comprises a light-sensitive diazo compound on a metallic base, and is heated to at least 180°C.

4. A process according to claim 2 in which the printing plate and the source of radiation are moved relative to each other, with the layer side of the plate facing the source of radiation.

5. A process according to claim 4 in which the radiation is focused on a straight line extending transversely to the relative movement between the printing plate and the source of radiation, and is caused to act simultaneously and uniformly over the entire width of the layer side of the printing plate.

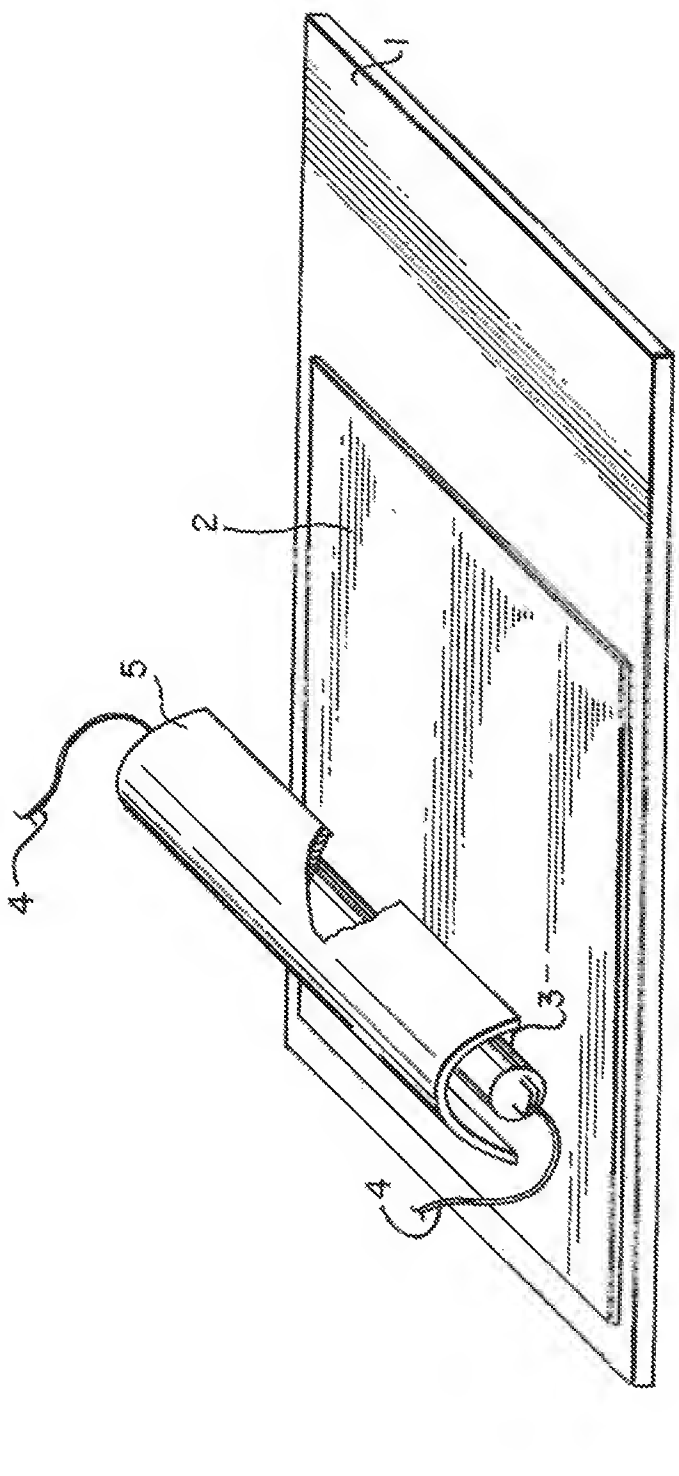
6. A process according to claim 5 in which the upper limit of the temperature of the plate is determined by controlling the relative motion between the printing plate and the source of radiation.

7. A process according to claim 6 in which the upper limit of the temperature of the plate is further determined by changing the distance between the printing plate and the source of radiation.

8. A process according to claim 2 in which the limitation of the temperature of the base is effected automatically.

9. A process according to claim 2 in which the back side of the printing plate is thermally insulated.

10. A process according to claim 2 in which the absorption capacity of the layer for the radiation is increased by dyeing.



PATENT AGENTS

Fetherstonhaugh & Co.